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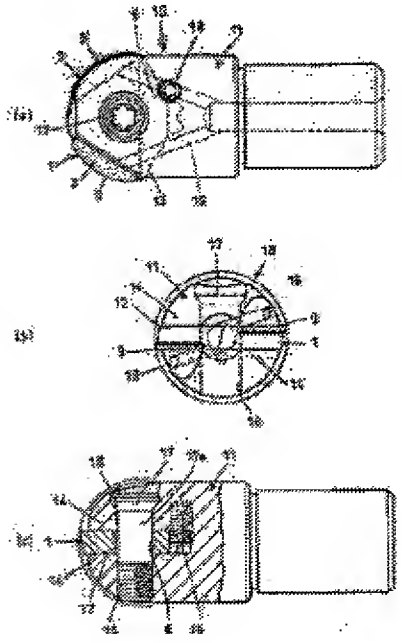
(54) THROWAWAY TIP FOR ASSEMBLY CUTTING TOOL

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a throwaway tip for an assembly cutting tool, easy to machining a through hole used for a clamp while requiring high accuracy, and capable of reducing a manufacturing cost because of an inexpensive material cost.
SOLUTION: The body part 2 of the throwaway tip 1 is formed by sintered super heavy metal, and the through hole 6 formed by cutting is provided in this body part. A blade piece 3 formed by a hard alloy and a sintered body is joined to the body part 2 in order to structure the tip 1, and the tip 1 is sandwiched between jaws 14 at the tip of a holder 11. In addition, the tip 1 is pressed onto a receiving surface 13 by a clamping screw 17 passed through the through hole 6 in order to fix the tip relative to the holder..



CLAIMS

[Claim(s)]
[Claim 1]Insert in a rate slot provided at a tip of a holder, and the upper and lower sides are pinched by a jaw which broke two and was carried out, In a throwaway tip for assembly cutting tools which applies pushing force to a surface with hole of a through hole which inserted in the component by a clamping member which binds a jaw tight, breaks the rear, is pressed against a receptacle side of a deep-part-of-the-groove end, and is fixed to a holder by the pinching and press, A throwaway tip for assembly cutting tools having formed a body part except a cutting edge part of the chip with a sintering super weight alloy, and providing said through hole in the body part.
[Claim 2]The throwaway tip for assembly cutting tools according to claim 1 made into a form where the whole which the tip side made a semicircle for upper-and-lower-sides ********** of a body part, and includes the rear side ****s inside one circle.
[Claim 3]The throwaway tip for assembly cutting tools according to claim 1 or 2 which formed a cutting edge part by hard metal or a hard sintered body, joined to a seat of a body part, and provided a hard enveloping layer which is excellent in welding-proof nature and abrasion resistance in the surface of the cutting edge part.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the throwaway tip which was especially suitable for the slow away type ball end mill for finish-machining with which high process tolerance is demanded also in the throwaway tip for assembly cutting tools.
[0002]
[Description of the Prior Art]As a conventional example of the assembly cutting tool which provides the rate slot on the single character at the tip of a holder (tool body), inserts a tabular throwaway tip in the rate slot, sandwiches the chip by the jaw at the tip of a holder broken and carried out by two rate slots, and is fixed, For example, there are some which are shown in JP,H8-252714,A or JP,H11-239911,A.
[0003]Each tool, such as this, is a ball end mill.
When pinching a throwaway tip by the jaw of a holder, pushing force is applied to the breakthrough of the chip which inserted in the component by the clamping member (clamp screw) which closes a jaw, and he is trying to press the rear of a chip to the receptacle side of the rate deep-part-of-the-groove end of a holder.

[0004]As for the throwaway tip used for this seed tool, the body part is formed by cemented carbide at least.
[0005]
[Problem to be solved by the invention]Since high processing energy is required, the ball end mill used for finish-machining of a metallic mold etc. needs to improve tool accuracy and the restricted stability of a chip. Therefore, although the press of the chip to a receptacle side is also performed, it not only pinches by the jaw of a holder, but, What wins popularity with bolting of a jaw and performs the press to a field by one clamping member, In order to win popularity in the position which bolting of a jaw ended and to also make the press to a field just, it is necessary to control highly the amount of clearances between the through hole of a tip side, and the drum section of a clamping member which inserts in the surface with hole of the hole, and applies the pushing force to back to a chip.
[0006]For this control, the bore diameter of the through hole provided in a throwaway tip needed to be finished with high precision, with the throwaway tip made from cemented carbide, grinding for that finishing was needed and a fall and cost hike of productivity are caused.
[0007]The purpose of this invention is to provide the throwaway tip which canceled this SUBJECT.
[0008]
[Means for solving problem]In order to solve above-mentioned SUBJECT, in this invention, the body part except the cutting edge part of a throwaway tip was formed with the sintering super weight alloy, and the through hole which inserts a clamping member in that body part was provided.
[0009]As for this throwaway tip, what was made into the form where the whole which the tip side made the semicircle for upper-and-lower-sides ********** of the body part, and includes the rear side ****s inside one circle is preferred.
[0010]It is also preferred to form a cutting edge part by the hard metal or the hard sintered body, for example, cemented carbide, cubic type boron nitride, etc., to join to the seat of a body part, and to provide the hard enveloping layer which is excellent in welding-proof nature and abrasion resistance in the surface of the cutting edge part.
[0011]As a hard enveloping layer for cutting tools, IVa, Va, group VIa elements, and aluminum of the periodic table, The nitride of at least one sort of metal selected Si, at least one sort of elements selected from B, or from them, The film formed with the PVD or CVD method which comprises at least one sort of

compounds in solid solutions, such as carbide, an oxide, or this, is known, and the enveloping layer used by this invention also has such a preferred thing.
[0012]
[Function]If the body part of a throwaway tip is formed with a sintering super weight alloy, a highly precise through hole can be cut and provided, grinding which time requires becomes unnecessary, and productivity drive cost reduction can be planned. Compared with cemented carbide, the raw material expense of a sintering super weight alloy is also cheap, and the cost reduction by this can also desire it.
[0013]Although processing by cutting of a high precision through hole is possible also for what forms the body part of a chip with alloy steel, a sintering super weight alloy is an alloy which has the super high density, the super-heatproof, and the super-intensity which use tungsten as the main ingredients.
As shown in Table 1, a longitudinal elastic modulus is large and high rigidity is acquired.
Thermal conductivity is high and there is little degradation by cutting heat. A coefficient of linear expansion does not produce a shape change easily in the abbreviation half of alloy steel. It is strong with heat and the hardness fall at the time of temperature up (fall of abrasion resistance and intensity) does not arise. There are many portions excellent in a characteristic side -- rust does not arise -- and a big difference is not attached to a life compared with the chip made from cemented carbide.
[0014]
[Table 1]

特性値比較

特　　性	焼結超重合金	合金鋼	超硬合金
縦弾性係数　GPa	350	206	620
熱伝導率　W/m・℃	84	17	105
線膨張係数　× 10^{-6}/℃	5.2	11.0	4.5
昇温時の軟化（鑞付け時 600~700℃）	変化なし	硬度低下	変化なし
錆 発 生	なし	あり	なし

[0015]What was made into the form where the whole which the tip side made the semicircle for upper-and-lower-sides ********** of the body part of a chip, and includes the rear side ****s inside one circle, It is made from the round bar material of a sintering super weight alloy, and an unnecessary part is deleted, and after that, by the method of carrying out additional processing of the part which cut into round slices and was left behind, a body part can be made and it becomes advantageous in respect of a manufacturing cost.
[0016]Abrasion resistance and welding-proof nature of what provided the hard enveloping layer which comprises material which was previously stated to the surface of the cutting edge part which comprises a hard metal and a hard sintered body improve, and it can attain reinforcement of a tool, and highly efficient-ization.
[0017]
[Mode for carrying out the invention]The embodiment of the throwaway tip of this invention is shown in drawing 1. This throwaway tip 1 is an object for ball end mills, and comprises the body part 2 formed with a sintering super weight alloy, and the hard metal joined to that body part or the blade piece 3 of a hard sintered body.
[0018]The upper surface 4 and the undersurface 5 of this throwaway tip 1 have fully raised parallelism, in order to suppress the edge deflection by the core quantity of a cutting edge and the deviation of angle distribution which are given to the blade piece 3 by the side of the upper surface and the undersurface. the mark 6 of drawing 1 (a) should cut and put it on to the body part 2 -- it is ********.
The clamping member for a chip clamp is inserted in this hole 6.

[0019]The body part 2 leaves the abbreviation half of a circle, and makes the tip side semicircular shapes, the rear side is made into the form omitted in the shape of a V character (it of a figure is 120 degrees of vertical angles), and the whole is settled into one circle. Therefore, the raw material of a round bar material can be cut into round slices, and the body part 2 can be made.
[0020]The mounting seat 7 gradated to the tip outer peripheral part by the side of the upper surface of this body part 2 and the tip outer peripheral part by the side of the undersurface is changed into a central symmetry state, and is provided, the blade piece 3 is brazed to that mounting seat 7, and the chip 1 is constituted.
[0021]8 is the crevice for the prevention from incorrect wearing of a chip which the backmost part of the

body part 2 was made unevenly distributed in one side, and was established in it. If the upper and lower sides are reverse at the time of wearing of the chip 1, the axis 18 (refer to drawing 3 (c)) provided in a holder will not be restored to the crevice 8, but thereby, it turns out that direction of a chip is not right.
[0022]Since escape is given to the cutting edge of the upper and lower sides, respectively, the peripheral face by the side of the tip of the body part 2 has been leaned moderately for reverse bordering on the center.
[0023]Drawing 2 shows the preforming article of the body part 2.This preforming article cuts the stoma which becomes a round bar material of a sintering super weight alloy with the crevice 8, the through hole 6 and the hole to make, and a 120-degree V cut.
After that is cut into round slices with fixed thickness, and additional processing, such as the mounting seat 7 and a chamfering of V cut parts, is performed to the started component, and it is made.
The blade piece 3 is joined and finish-machined to this, and the throwaway tip 1 of drawing 1 is completed.
[0024]Drawing 3 is an example of the ball end mill incorporating the throwaway tip of drawing 1. This ball end mill 10 breaks the rear by which the V cut was carried out to the rate slot 12 provided at the tip of the holder 11 in the throwaway tip 1, is made to contact the V character-like receptacle side 13 of a deep-part-of-the-groove end, and he inserts it, and is trying to pinch it by the jaw 14 of the holder which broke that two chip 1 and was carried out. Bolting of the jaw 14 is made by the clamp screw 17 of the countersunk head thrust into the tapped hole 16 which it let pass to the breakthrough 6 of the chip from the countersink 15 established in one jaw, and was established in the jaw of another side.
[0025]He is trying to add the power of the clamp screw 17 making the drum section 17a tapered shape becoming thinner in the tip direction, or carrying out eccentricity of the countersink 15 of a taper to the rear side of a holder, binding it tight to the tapped hole 16, and sometimes pushing the chip 1 back in an engagement face with the breakthrough 6.
According to the pushing force, the rear where the V cut of the chip was carried out wins popularity, and it is pressed by the field 13.
18 is the axis (it of a figure is a screw-thread axis) provided in the holder, and be involved with the crevice 8 of a chip as stated above -- it is used for the prevention from **** wearing.
[0026]19 is an oil hole.
It is provided in the holder 11 if needed.

[0027]In order to raise the deflection precision of the edge of a blade, edge attachment processing of the final finishing of this ball end mill 10 may be performed after attaching a throwaway tip to the holder 11. 9 of drawing 3 (a) and (b) is the cutting edge which made it such and was given to the blade piece 3.
[0028]Below, the evaluation test of cutting performance is described.
[0029]The throwaway tip (comparative example) of the sample 1 which the evaluation test carried out solder attachment of the hard sintered body at the body part made from cemented carbide (base metal), and was made with the cutting edge, Carry out solder attachment of the hard sintered body same to the body part made from a sintering super weight alloy as the sample 1, and further on the surface of a cutting edge, the throwaway tip (invention) of the made sample 2, and the throwaway tip of the sample 2 and an identical configuration by PVD. It carried out by preparing the throwaway tip (invention) of the sample 3 which provided the enveloping layer of TiAlN of 2.0-micrometer thickness.
[0030]Each throwaway tip was made into the form shown in drawing 1, the through hole of the chip of the sample 1 was ground and finished, and the through hole of the chip of the samples 2 and 3 was cut and made.
[0031]As a sintering super weight alloy which forms the body part of the chip of the samples 2 and 3, Tungsten content 95wt%, the specific gravity 18, hardness HRC28, compression proof stress (distorted 0.2%) 780MPa, Tensile strength 880MPa, proof stress (distorted 0.2%) 650MPa, 25% of elongation, What shows the characteristic of longitudinal-elastic-modulus 350GPa, anti-**** 2.2GPa, and impact resistance value 4.9J/cm^2, thermal conductivity 84W/mand**, and coefficient-of-linear-expansion $5.2x10^{-6}$/** (Sumitomo Electric Industries heavy metal HM-5) was used.
[0032]Samples, such as this, were included in the holder of the same structure, and the ball end mill with a cutting diameter of 17 mm was constituted, then it cut, and the performance was evaluated.
[0033]The work material used for the examination is block material [of the form which shows SCN415 hardness HRC60 to drawing 4 which carried out carburization hardening] W.
[0034]This block material W on condition of tool number-of-rotations N=3500min^{-1}, cutting speed V=194 m/min, feed-rate F=800 mm/min, the infeed of d= 0.2 mm, and dry atmosphere, As shown in drawing 4,

the ball end mill 10 was linearly moved in the direction inclined 45 degrees, and it was processed, and the machined surface granularity after both-way 20 path processing was investigated by using from alpha point to beta point as an one pass. The result is shown in Table 2.

[0035]

[Table 2]

	材　　料	仕上げ面粗さRz(μm)
試料1（比較例）	本体部超硬合金	1．73
試料2（発明品）	本体部焼結超重合金	1．75
試料3（　〃　）	〃　　+TiAlN被覆	1．60

[0036]If the result of this table 1 is considered, it will be thought that there is no great difference in the machined surface granularity of the sample 1 which used cemented carbide for the body part of the chip, and the sample 2 using a sintering super weight alloy, and there is no influence on the process tolerance by the difference in the construction material of a body part. It is thought that the sample 3 which covered TiAlN on the surface was finished in 3 samples, its surface roughness was the best, and that welding-proof nature improved by covering of TiAlN finished it, and it was connected with improvement in surface roughness.

[0037]It is known that the enveloping layer which comprises TiAlN etc. is excellent in welding-proof nature and abrasion resistance, and what provided the enveloping layer can attain not only the improvement in cutting performance but reinforcement of a chip.

[0038]

[Effect of the Invention]As stated above, since it formed the body part except a cutting edge part with the sintering super weight alloy, the throwaway tip of this invention can cut the through hole as which high degree of accuracy is required, can be opened, and its material cost is also inexpensive compared with cemented carbide, and it can plan a productivity drive and cost reduction.

[0039]A sintering super weight alloy has the characteristic near cemented carbide, and can secure the life which is equal compared with the chip made from cemented carbide.

[0040]As a raw material, what made the body part the form settled into one circle can use a round bar material, and its time and effort of manufacture decreases, and it becomes still more advantageous by a cost aspect.

[0041]Abrasion resistance and welding-proof nature of what established the hard covering surface on the surface of the cutting edge part improve, and its a life improves more.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1](a) The top view showing the embodiment of the throwaway tip of this invention
(b) The front view of a chip same as the above
(c) Similarly it is a side view.
(d) The sectional view of the X-X line part of drawing 1
[Drawing 2](a) The top view showing the preforming article of the body part of a chip
(b) The front view of a preforming article same as the above
(c) Similarly it is a side view.
[Drawing 3](a) The top view of the ball end mill using the chip of drawing 1
(b) The front view of an end mill same as the above
(c) Similarly it is a partially broken side view.
[Drawing 4]The explanatory view of a performance evaluation test method
[Explanations of letters or numerals]
1 Throwaway tip
2 Body part
3 Blade piece
4 Upper surface
5 Undersurface
6 Through hole
7 Mounting seat
8 The crevice for incorrect wearing prevention
9 Cutting edge
10 Ball end mill
11 Holder
12 Rate slot
13 Receptacle side
14 Jaw
15 Countersink
16 Tapped hole
17 Clamp screw
17a Drum section
18 Shank
19 Oil hole

[Translation done.]